BELL WORK
13-Nov-2017

What are the three classes of elements?

metals **nonmetals** **metalloids**

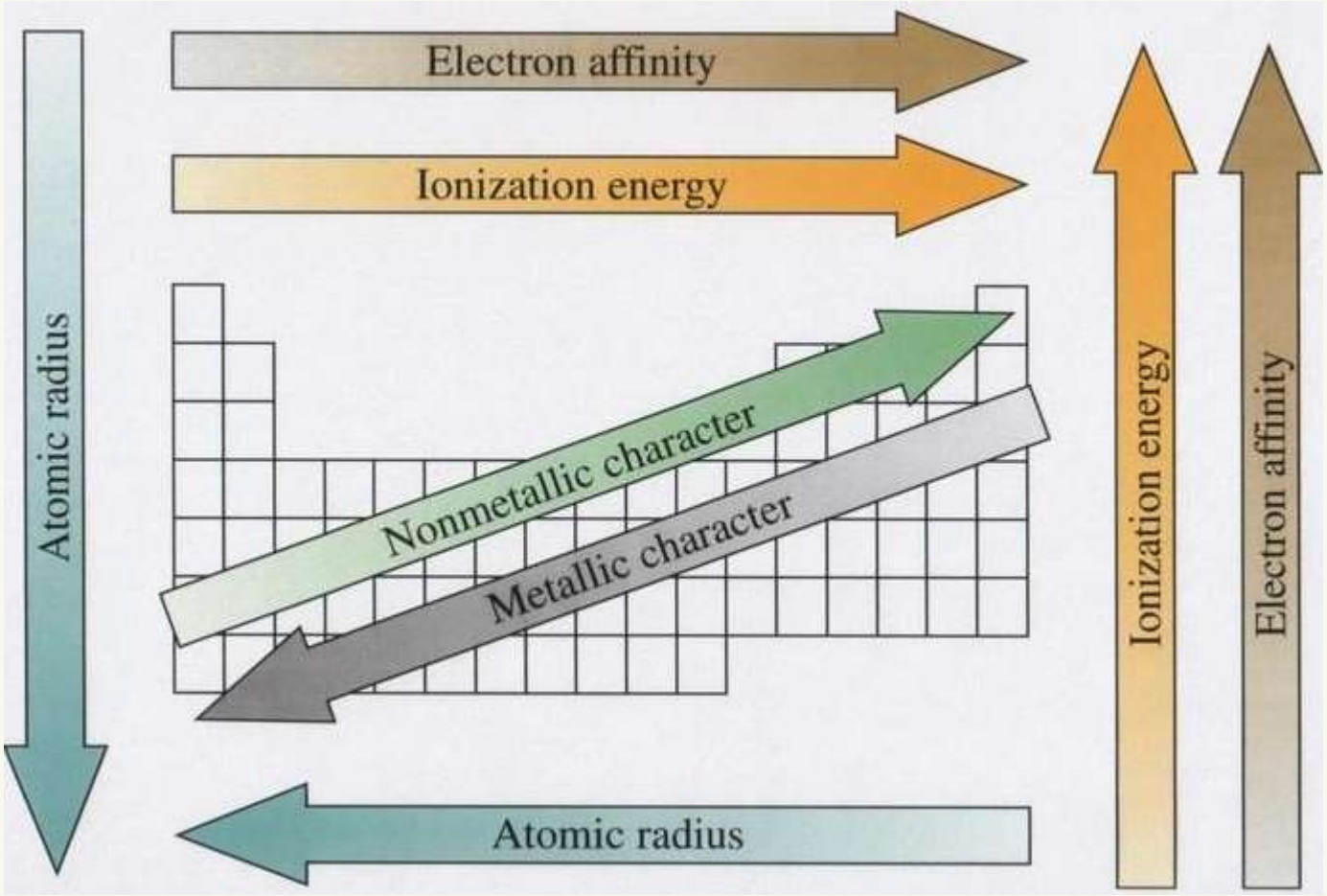
What is the general trend for electronegativity on the periodic table?

EQ: With so many source of energy why do you limit yourself to the one you are currently using?

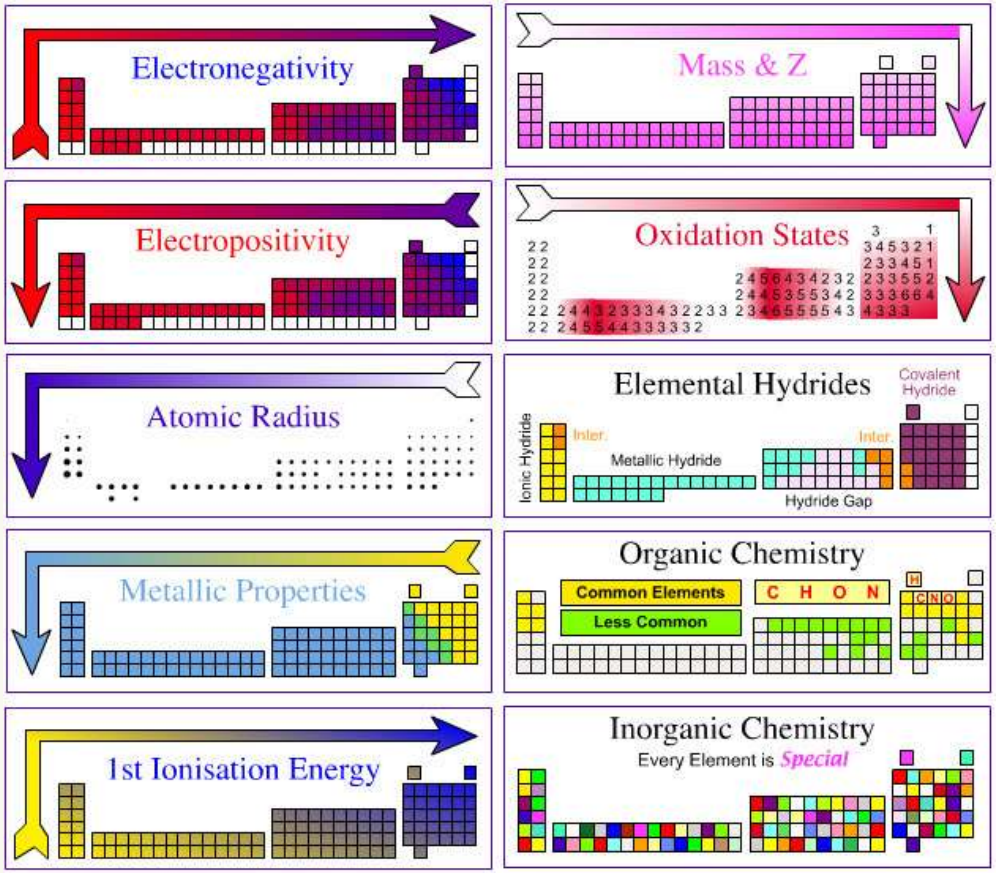
Objectives

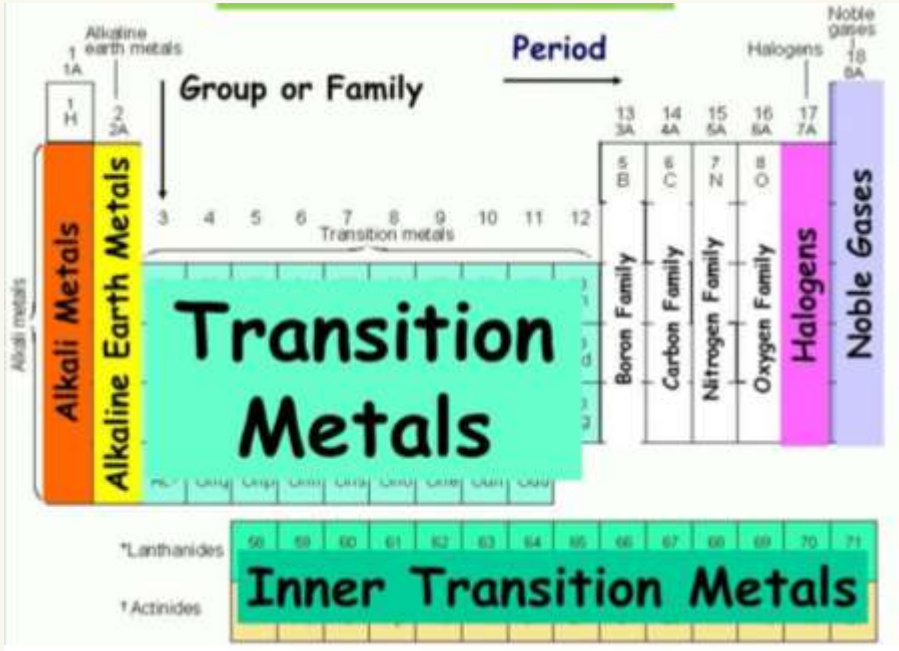
Fill Out an orbital and electron configuration diagram

Periodic Trends



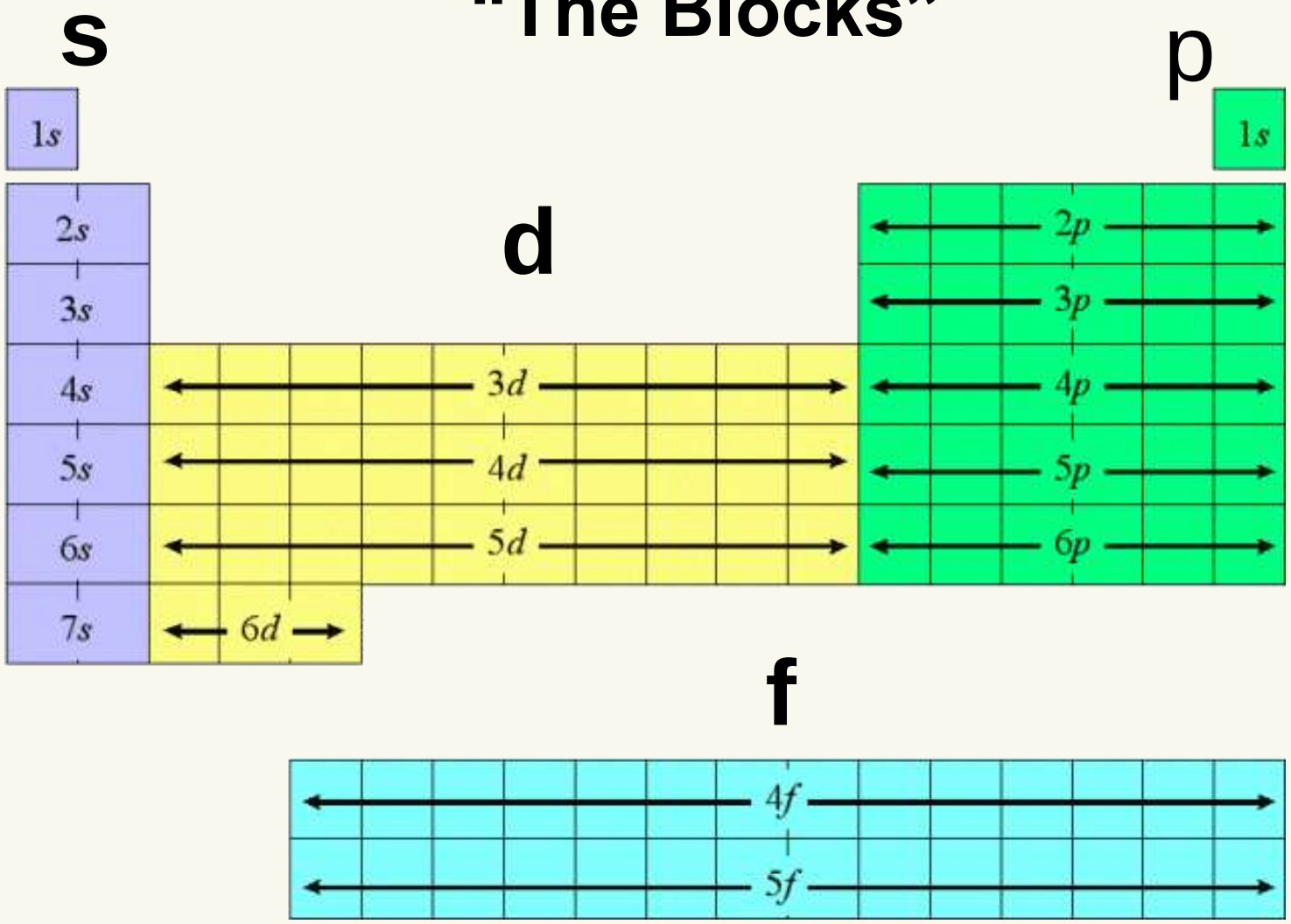
Periodic Trends



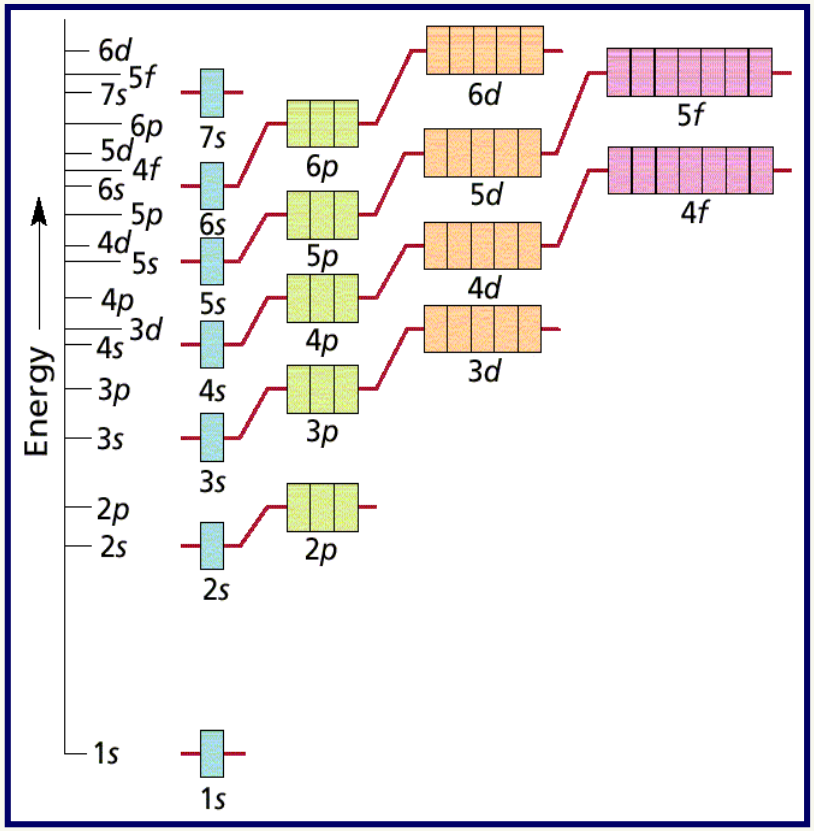


Electron Configuration

"The Blocks"



Electrons in Atoms



Electron Configuration

(p. 117 – 131
Reading hw for tonight)

BELL WORK
15-Nov-2017

I. What is the maximum number of electron that can go in the 3rd energy level?

II. After being in school for >10yrs, what should you always include on every assignment unless told otherwise?

III. When turning in work via email in this class the assignment should be sent as a link or an attached file?

Objective

You will be able to recall and apply:

4 quantum numbers,

# of electrons in each orbital,

Aufbau principle,

Hunds Rule,

and Pauli exclusion principle

Labeling Period Table for Electron Configuration

http://www.youtube.com/watch?v=8TZ97JLWqMA&feature=relatedn

Arrangement of e^- in Atoms

e^- in atoms are arranged as:

SHELLS (n)

SUBSHELLS (l)

ORBITALS (m_l)

The location of an electron can be predicted by using the four (4) quantum numbers

Arrangement of e^- in Atoms

Each orbital (m_l) can be assigned no more than 2 electrons!

This is tied to the existence of a 4^{th} quantum number, the e^- spin quantum number, m_s.

The Orbital's

The “s” block has one (1) orbital

The “p” block has three (3) orbital's

The “d” block has five (5) orbital's

The “f” block has seven (7) orbital's

Lets look at/ count them on the periodic table

General Rules

Pauli Exclusion Principle

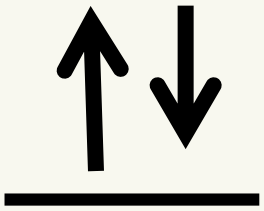
No two electrons in the same atom can have the same set of 4 quantum numbers.

That is, each electron in an atom has a unique address of quantum numbers.

General Rules

Pauli Exclusion Principle

Each orbital (m_l)can hold **TWO (2)** electrons with opposite spins.

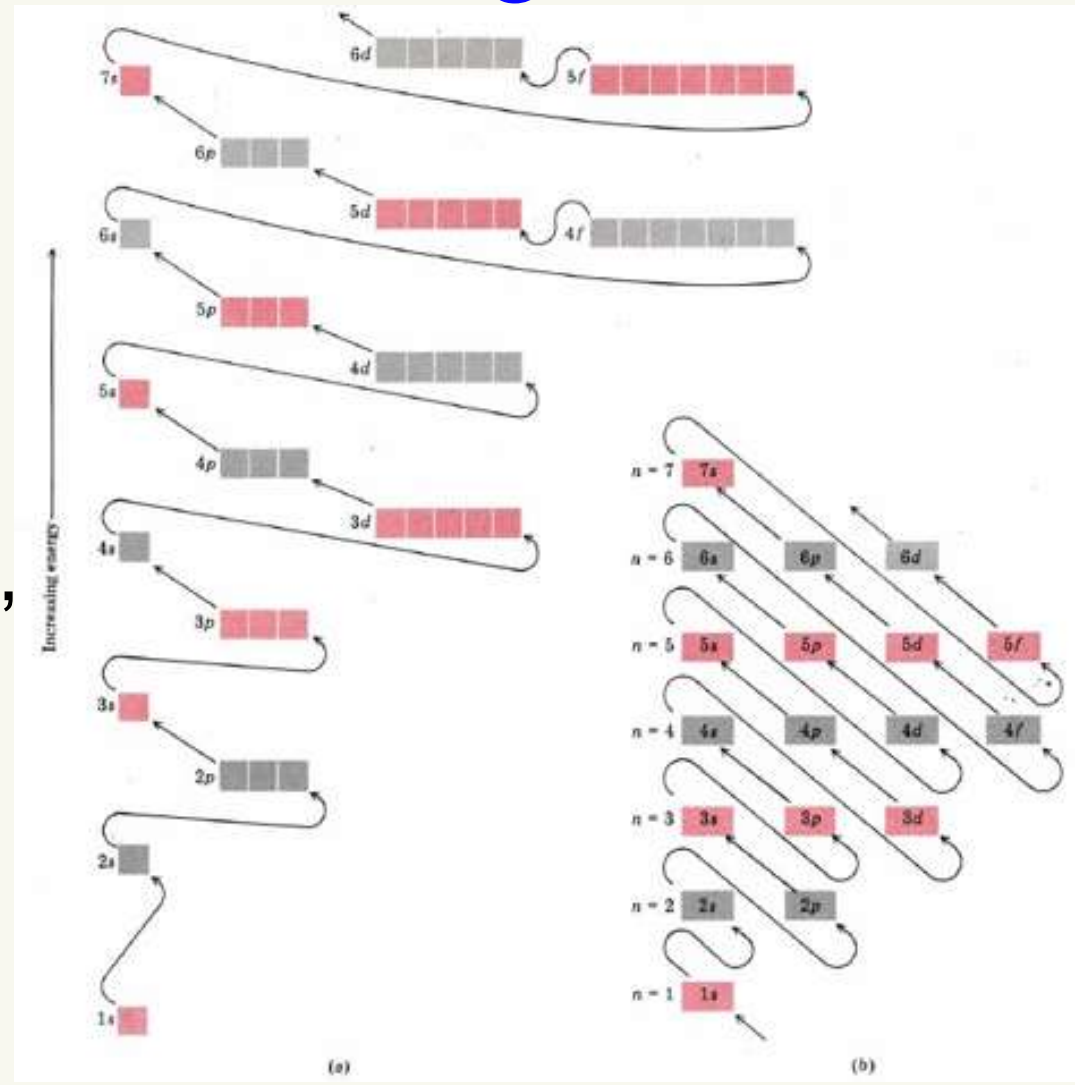


General Rules: Filling Order

Aufbau Principle

e$^-$ fill the lowest energy orbitals first.

"Lazy Tenant Rule"

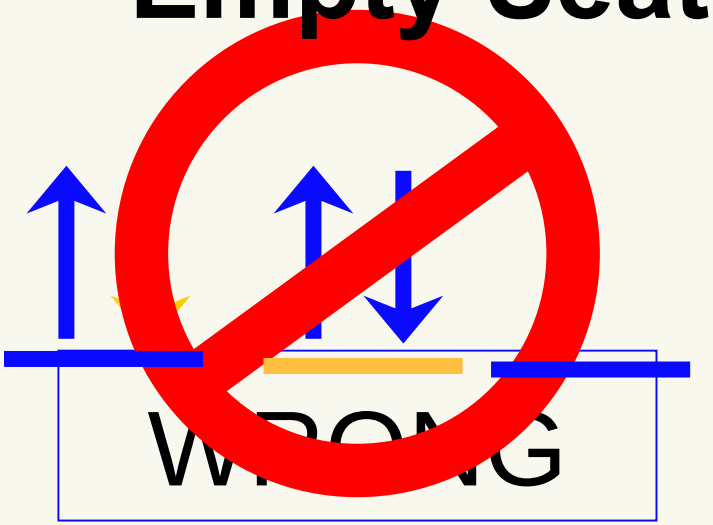


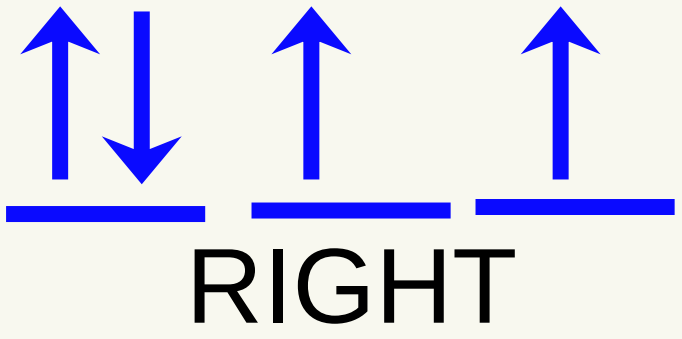
General Rules

Hund's Rule

Within a sublevel, place one e^- per orbital before pairing them.

"Empty Seat Rule"





BELL WORK
16-Nov-2017

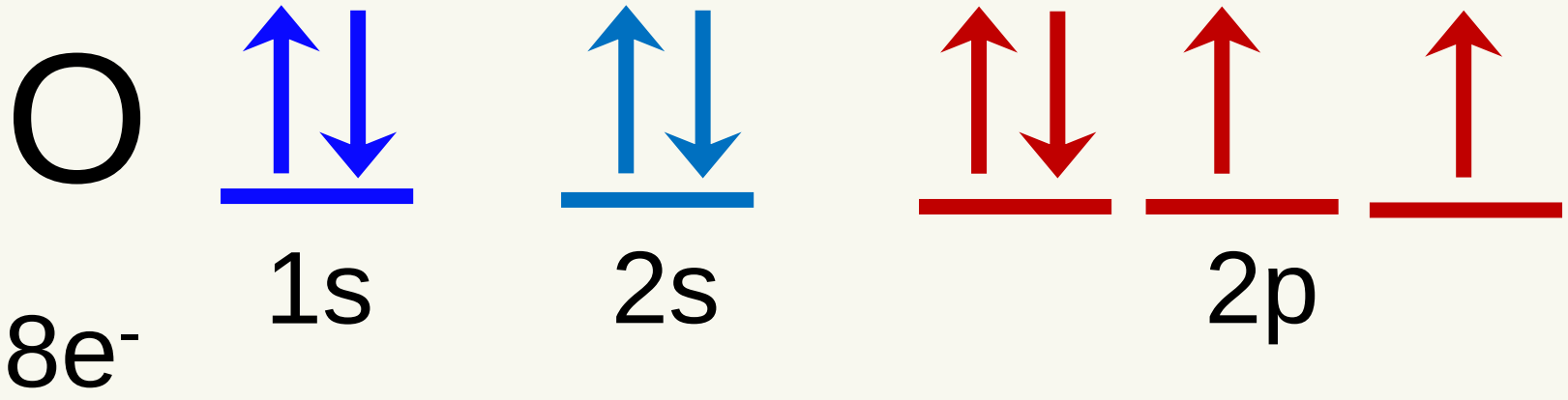
I. What are the steps to writing the electron configuration of an atom or ion (charged element)?

a. Apply those steps in writing the long hand electron configuration for Al.

b. Write the short hand configuration for Al.

Notation

Orbital Configuration: Uses arrows



Electron Configuration: Uses supper scripts

$$\mathbf{1s^2\ 2s^2\ 2p^4}$$

Notation

Longhand Configuration

S 16e$^-$ $1s^2 2s^2 2p^6 3s^2 3p^4$

Core Electrons **Valence Electrons**

Shorthand Configuration

S 16e$^-$ [Ne] $3s^2 3p^4$

Valence electrons

Valence electrons are the ***electrons*** contained in the outermost, or "***valence***", ***electron*** shell of an atom.

They are involved in the bonding between atoms

$1s^2$ $2s^2$ $2p^6$$3s^2$$3p^3$

Practice…

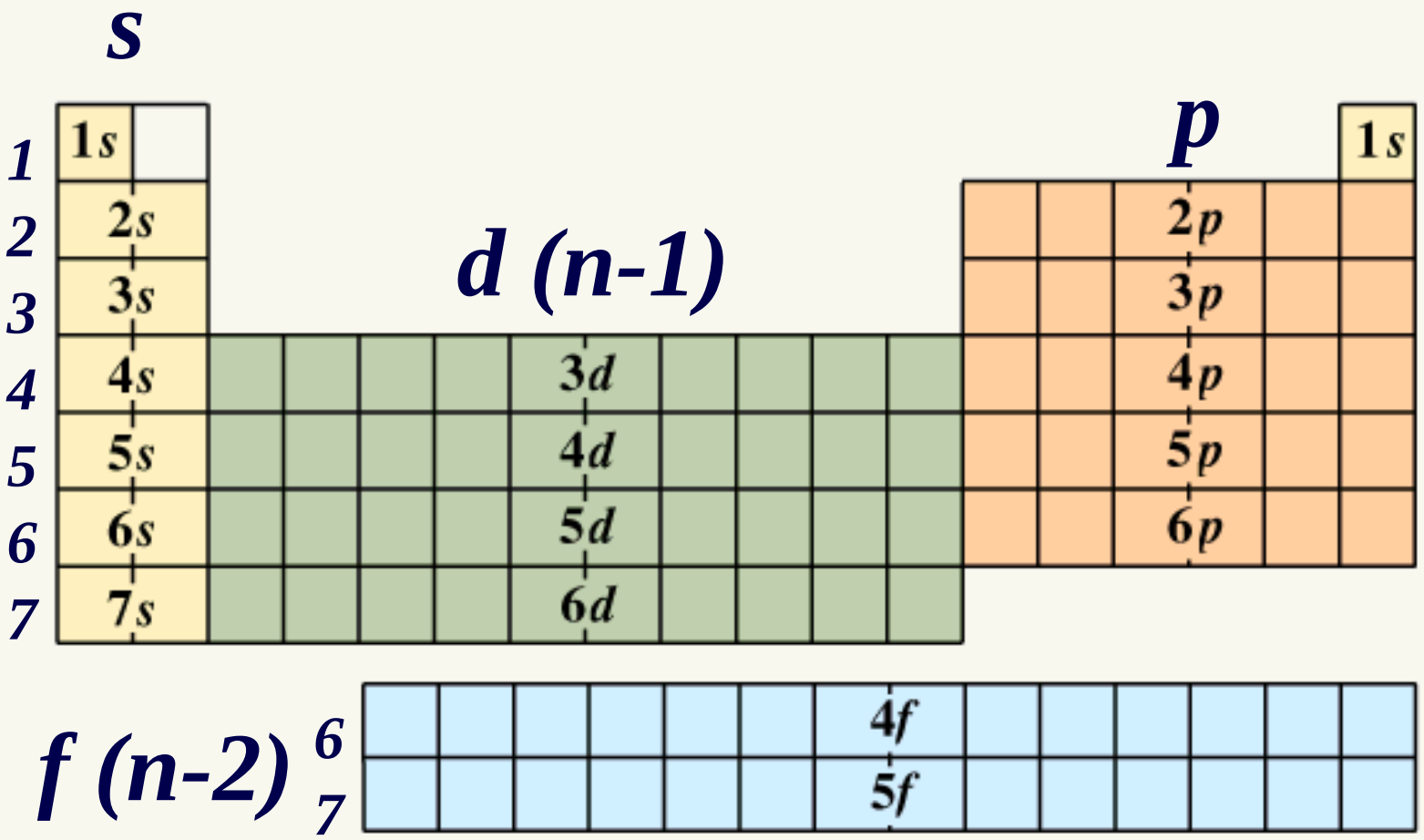
Give the Longhand Configuration for

P **15e$^-$** $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

Give the Shorthand Configuration for

Br **35e$^-$** **[Ar] $4s^2\ 3d^{10}4p^5$**

Periodic Patterns



Periodic Patterns

Period #

energy level (subtract for d & f)

A Group #

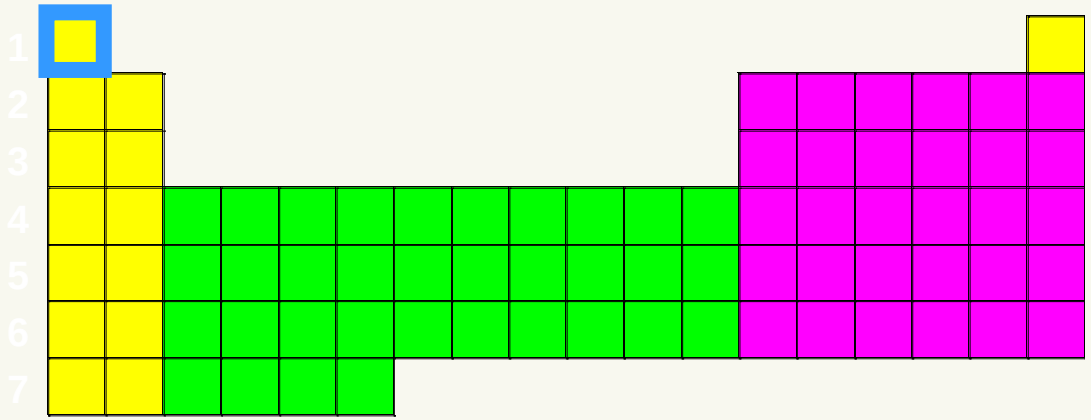
total # of valence e^-

Column within sublevel block

of e^- in sublevel

Periodic Patterns

Example - Hydrogen



$1s^1$ ← 1st column of s-block

1st Period ↑

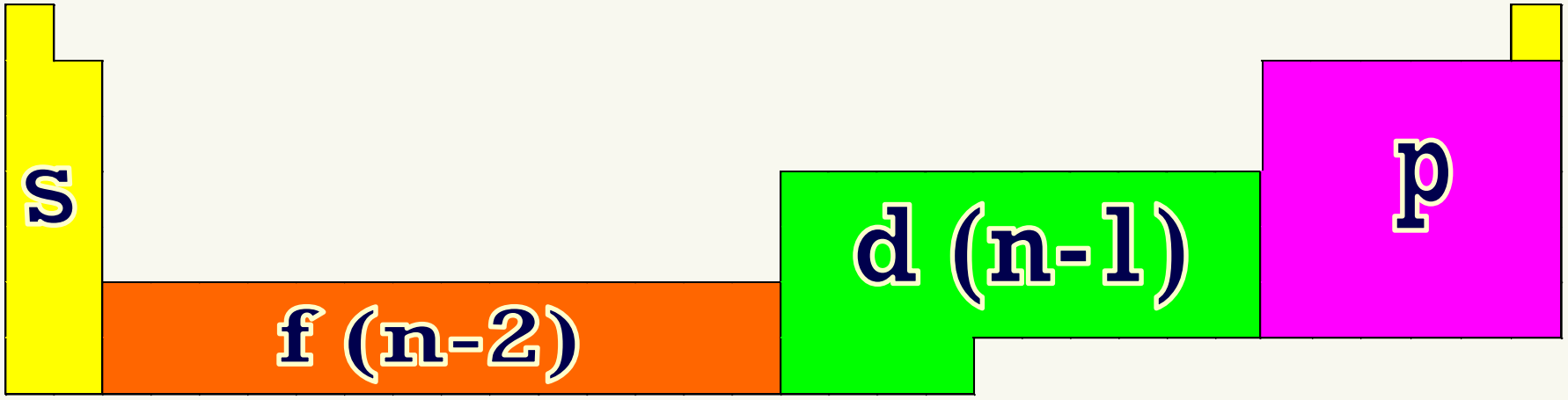
↑ s-block

Periodic Patterns

Shorthand Configuration

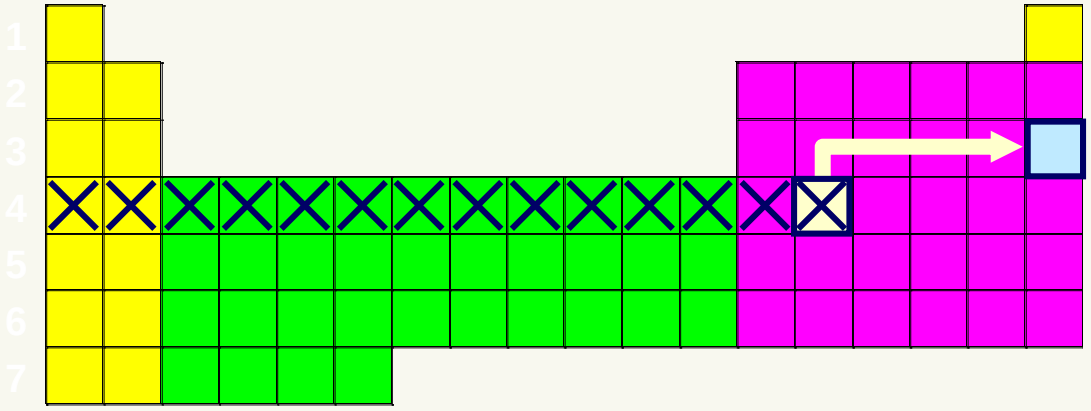
Core e⁻: Go up one row and over to the Noble Gas.

Valence e⁻: On the next row, fill in the # of e^- in each sublevel.



Periodic Patterns

Example - Germanium



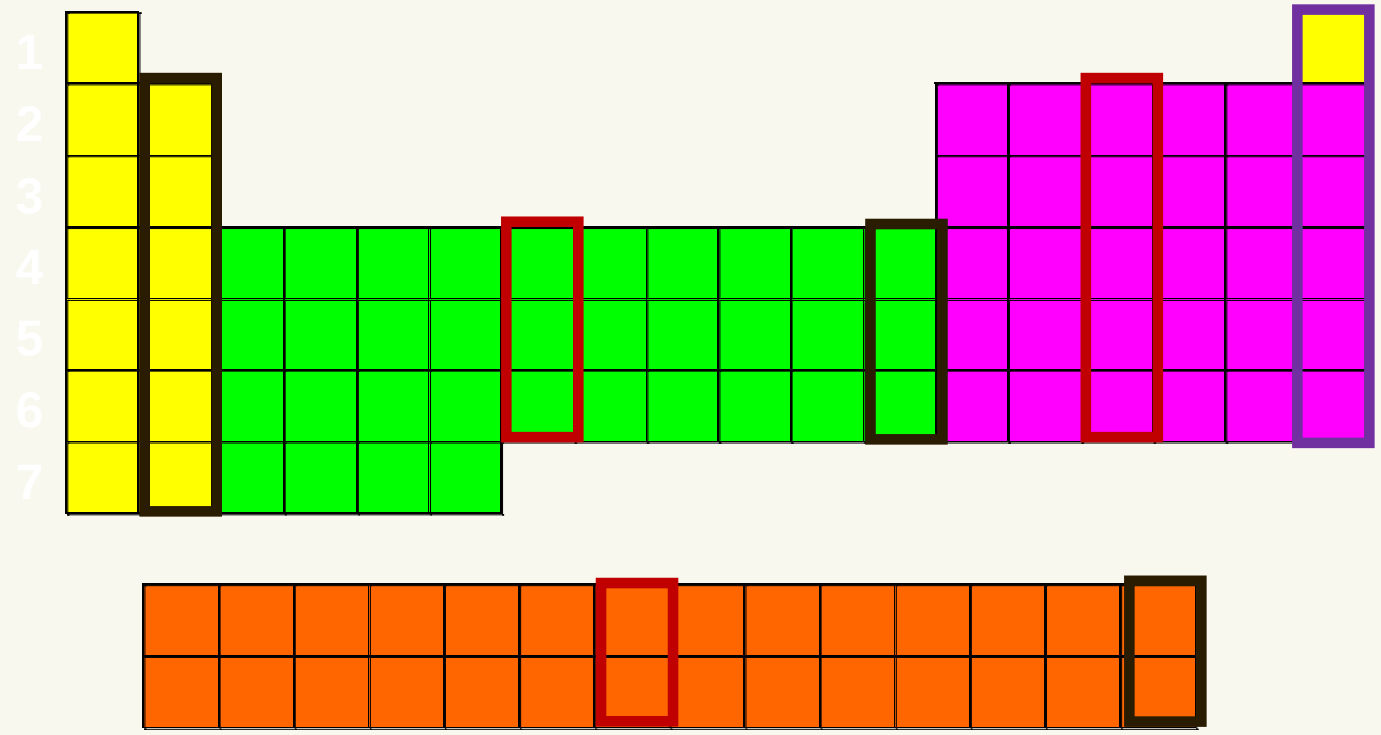
$$[Ar]\ 4s^2\ 3d^{10}\ 4p^2$$

Stability, See page 152 in text

Full energy level

Full sublevel (s, p, d, f)

Half-full sublevel

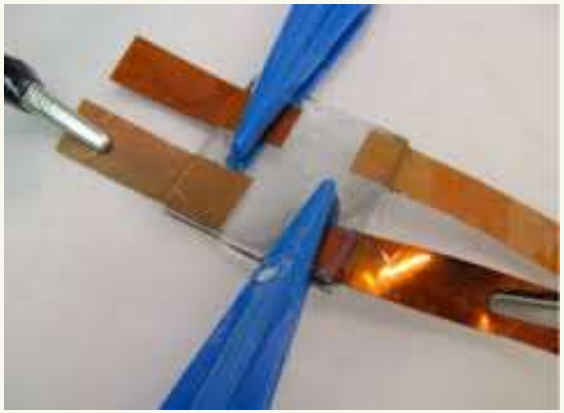


Preparation of Gel Electrolyte…

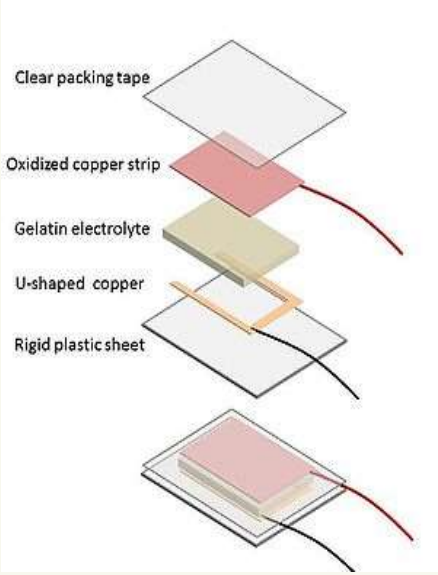
Lab,

See hand out.

Safety First!



pages.vassar.edu



http://photonicswiki.org

Semiconductor

https://youtu.be/33vbFFFn04k

Ion configuration

What are the ion configurations for the following ions?

N^{3-}

Cl^{-}

Ca^{2+}

Before You Go

What “block” are the transition elements in?

The Periodic Table: An Activity

Electron Configuration and Quantum Number

BELL WORK
17-Nov-2017

List the number of valence e^- for each;

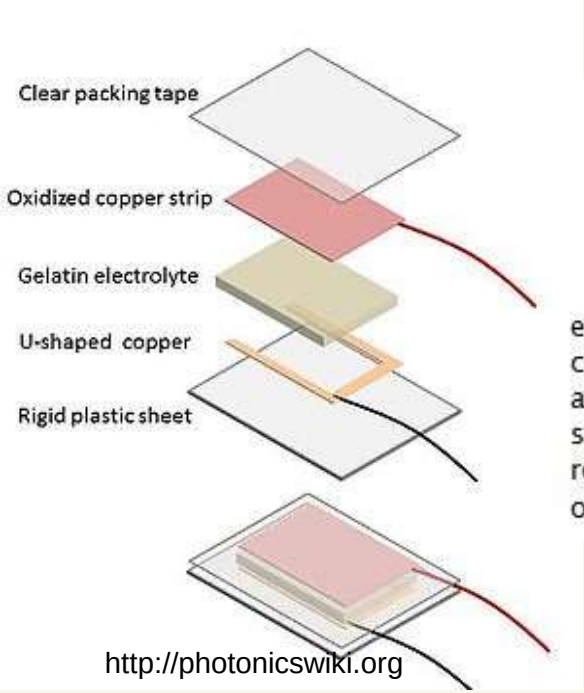
Ca **Sb** **Br**

When you finish please get a copy of the Solar Cell Lab and Start reading the introduction/ defining the italicized words on a new Blank sheet of paper Titled "Cu_2O:Cu Solar Cell"

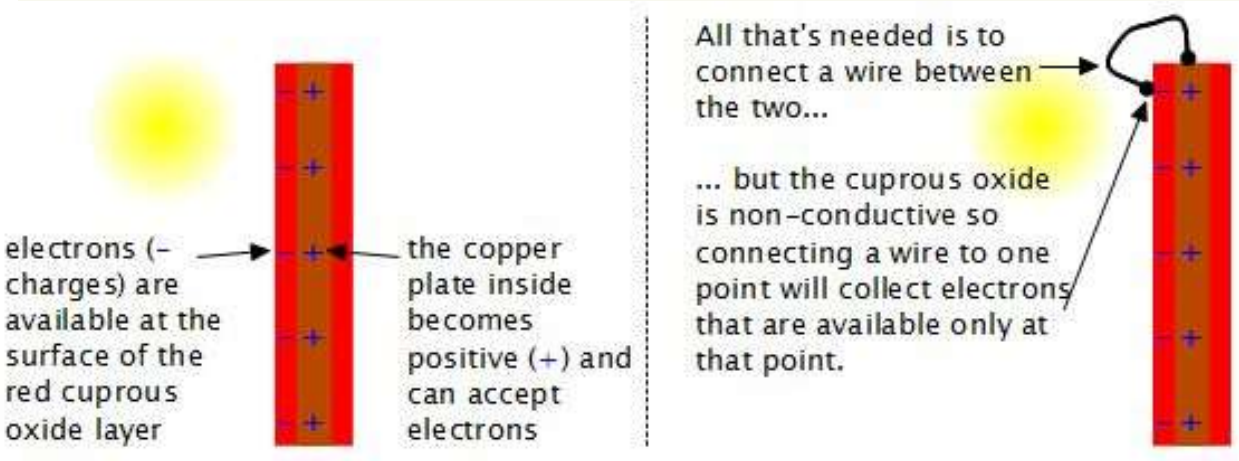
Objective:

You will prepare components of a simple solar cell and be able to identify what they are used for.

Cu_2O:Cu Solar Cell



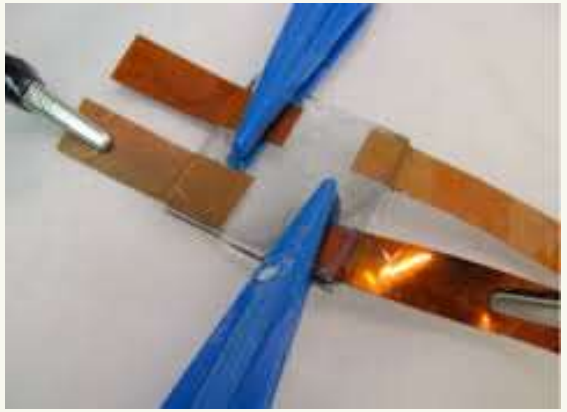
http://photonicswiki.org



https://rimstar.org

Lab, See hand out.

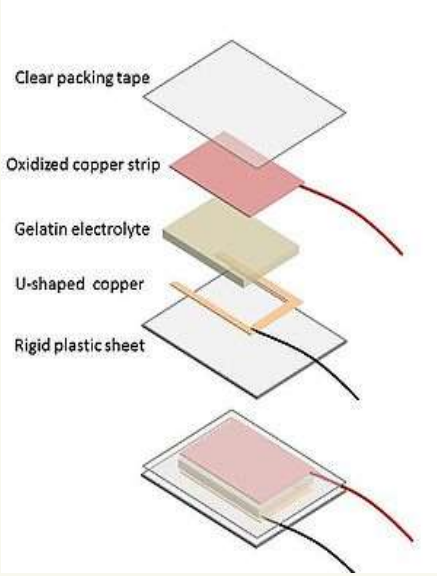
Safety First!



pages.vassar.edu

Preparation Solar Cell Components…

Preparation of Copper (I) Oxide Semiconductor and parts



1. Copper (I) Oxide, Cu_2O

Gel Electrolyte

2. Bare Clean Copper, Cu

3. Transparency

http://photonicswiki.org

Preparation Solar Cell Components…

Wipe off all Sharpie and Oil stains from both pieces of Copper with a small amount of Ethanol on a paper towel before you start.

Store prepared components on envelope with your name on it for final assembly on Monday.

Bell Work
20-Nov-17

How are group number and number of valence electrons related?

What is the trend for electronegativity?

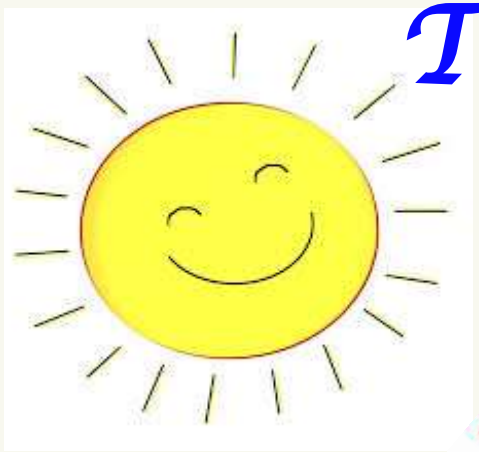
What are the ion configurations (short hand) for the following ions?

P^{3-} Al^{3+}

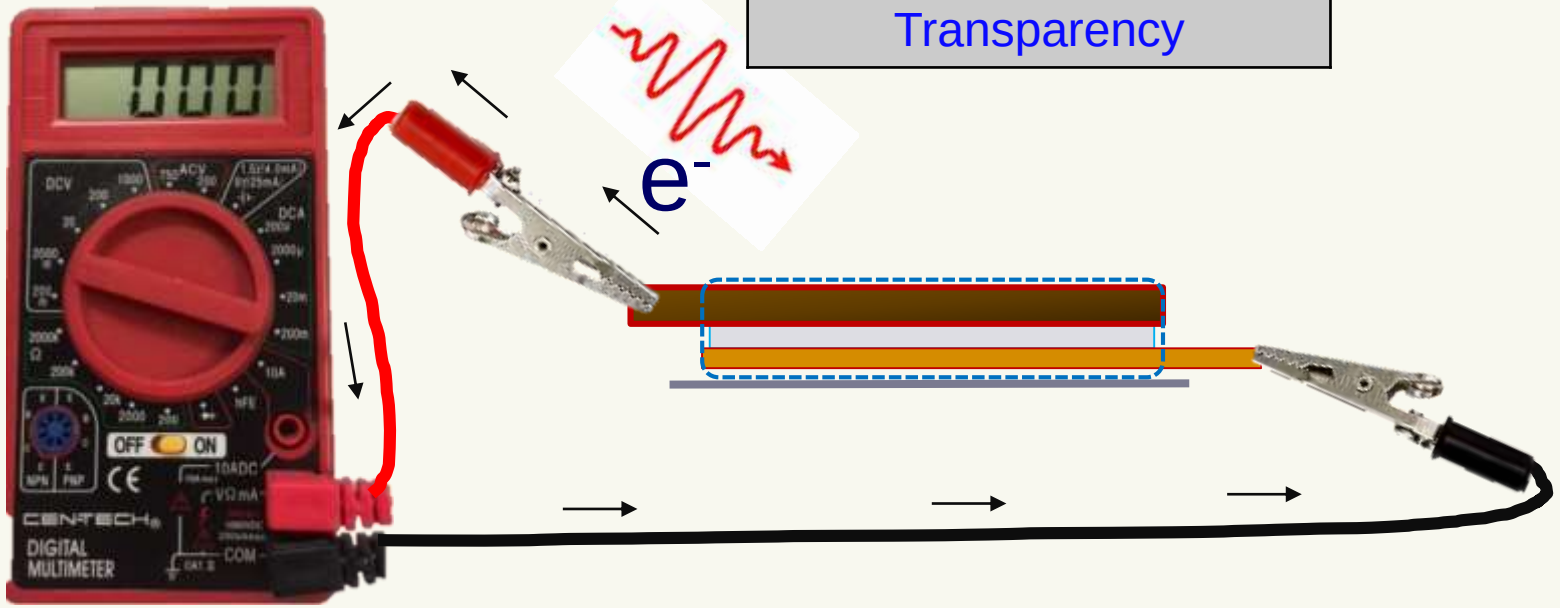
Objective:

You will finish building your solar cells from the components of a simple solar cell and be able to identify what they are used for.

Testing Solar Cell



Copper (I) Oxide, Cu_2O
Electrolyte gel
Copper, Cu
Transparency



The Boom!

$H_2C_2\,(g) + O_2\,(g) \rightarrow CO_2\,(g) + H_2O(l)$

Before You Go

What are the outer electrons called?

Objective:

You will be able to DRAW the Lewis dot structure of any representative element and Noble gas.

Single Atom Lewis Structures

What do they look like?

Procedure

1. Write element symbol
2. Add valence electrons (dots) around element symbol

How can we determine valence electron with out writing the electron configuration

If valence electrons are paired in an orbital, pair them on the structure, if not, don't (keep them single)

How many valence electrons do the following atoms have?

Valence Electrons

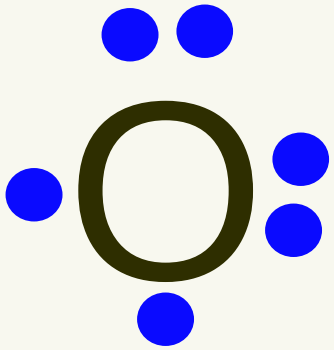
How many valence electrons do the following atoms have?

Cl C Al Mg K

Single Atom Lewis Structures

Procedure

1. Write element symbol: **O**
2. Add valence electrons (dots) around element symbol. **Oxygen has 6 valence electrons**

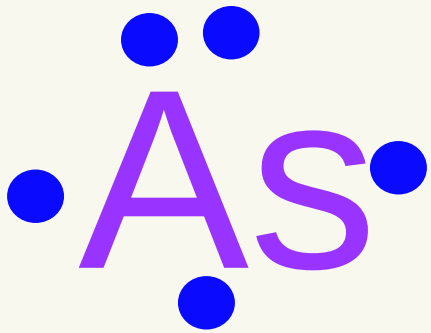


Single Atom Lewis Structures

Lets try another:

As

Identify the number of valance electrons ____



You try More Practice:

H, He, F, P, Mg, N, Kr

Test Topics, 21-Nov-2017

How do you calculate wavelength, frequency, and energy?

How does a spectroscope work and what does it do?

Organization and sections of the periodic tabel

What are the trends on the periodic table?

What are the groupings on the periodic table based on electron configuration?

What are the rules for electron filling/ distributions?

Book Review

Page	Problem
106	#44-48, 52
118, 125	#6-11
130	#15
149	#2, 3
157	#6, 7, 8
159	#15-17

Before You Go…

Think about why would it have been hard for Mendeleev to organize the periodic table in the same fashion as the modern one?

Objective:

Understand how to write electron configurations for ions

You will be prepared for our test on Monday!

Some more practice…

Identify the following elements based on their electron configurations:

$1s^2 2s^2 2p^6 3s^2 3p^3$

$[Ar] 4s^1$

$1s^2 2s^2 2p^1$

$1s^2 2s^2 2p^5$

$[Ne] 3s^2$

$[Ne] 3s^2 3p^5$

$[Ar]\ 4s^2$

The Four Quantum Numbers

n → shell **1, 2, 3, 4, ...**

l → subshell 0, 1, 2, ... n - 1

l corresponds to a specific sub shell – so when l =0 it refers to s sublevel, when l =1 in refers to the p sublevel and so on.

m_l → orbital -l ... 0 ... +l

m_s → e^- spin +1/2 and -1/2

Quantum number

What element would fall in at these quantum numbers?

$n = 3, l = 2, m_l = -2, m_s = -1/2$

Stability

Electron Configuration Exceptions

Copper

EXPECT: $[Ar]\ 4s^2\ 3d^9$

ACTUALLY: $[Ar]\ 4s^1\ 3d^{10}$

Copper gains stability with a full d-sublevel.

Stability

Electron Configuration Exceptions

Chromium

EXPECT: [Ar] $4s^2$ $3d^4$

ACTUALLY: [Ar] $4s^1$ $3d^5$

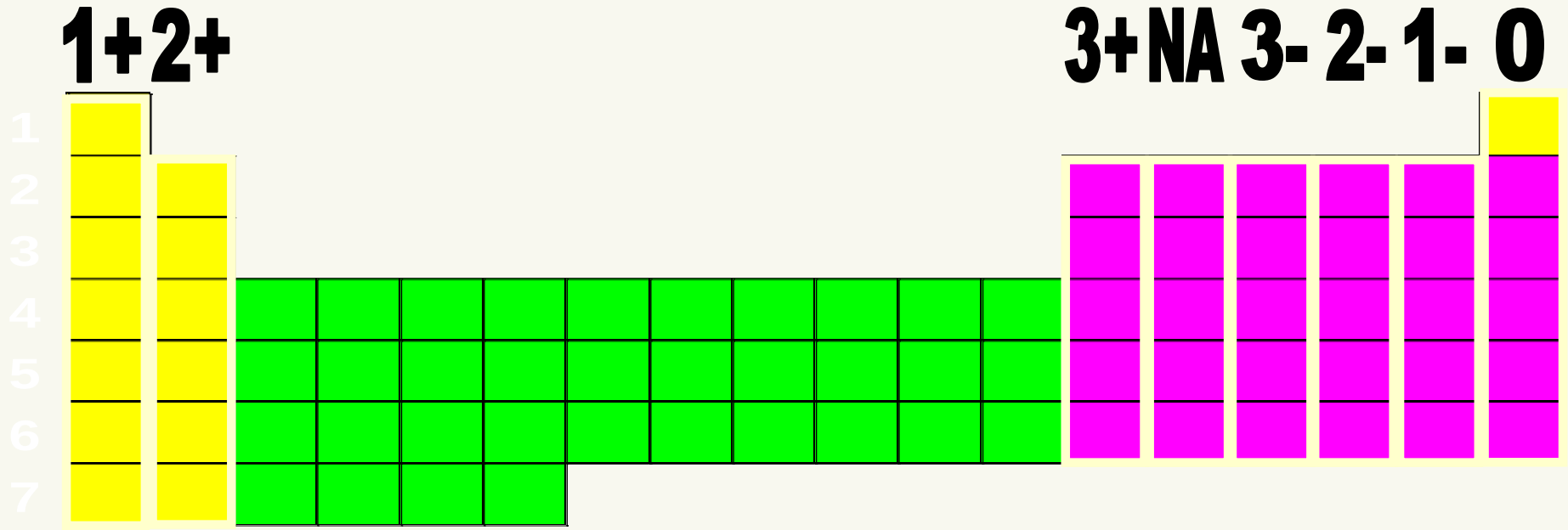
Chromium gains stability with a half-full d-sublevel.

Stability

Ion Formation

Atoms gain or lose electrons to become more stable.

Isoelectronic with the Noble Gases.



Stability

Ion Electron Configuration

Write the e^- config for the closest Noble Gas

EX: Oxygen ion $\rightarrow$ $O^{2-} \equiv$ Ne

O^{2-} $10e^-$ $[He]\ 2s^2\ 2p^6$

Ion configuration

What are the ion configurations for the following ions?

N^{3-}

Cl^{-}

Ca^{2+}

Practice

On the paper you that you completed your last HW assignment:

Do problems 62 and 63 on page 134 in your book.

If you finish early start reading pages 151-156 (it your HW tonight)

Bell Work
21-Nov-2017

Get out a blank sheet of paper, green sheets, calculator, and pencil.

Get a joke ready for the class?